FOUCHD "PTEB2B60

FIG. 1

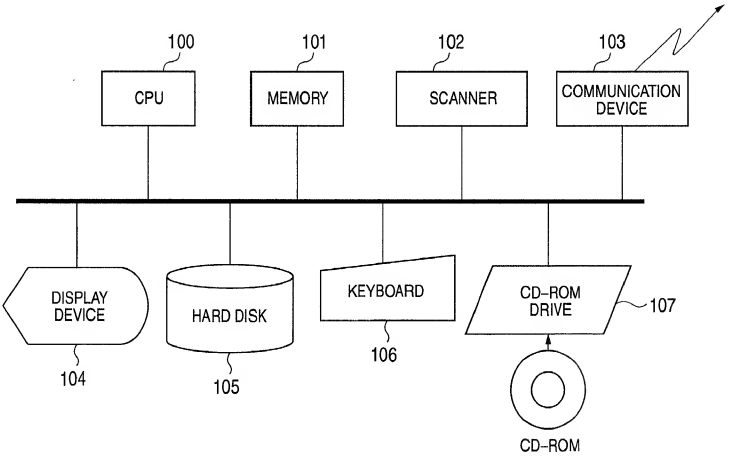


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FIG. 2

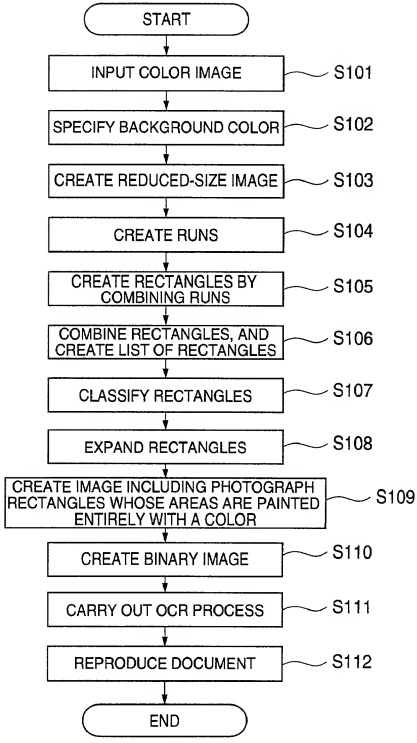
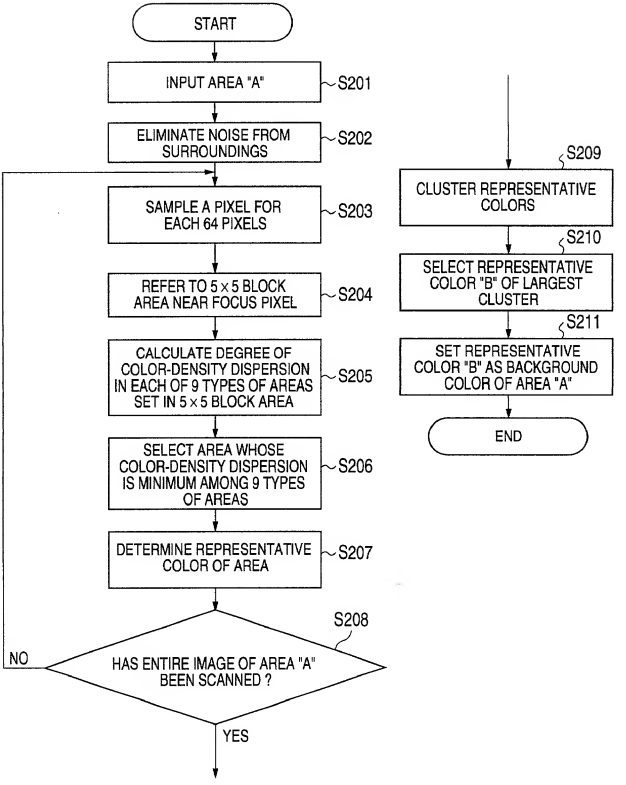

START
INPUT COLOR IMAGE
S101
SPECIFY BACKGROUND COLOR
S102
CREATE REDUCED-SIZE IMAGE
S103
CREATE RUNS
S104
CREATE RECTANGLES BY COMBINING RUNS
S105
COMBINE RECTANGLES, AND CREATE LIST OF RECTANGLES
S106
CLASSIFY RECTANGLES
S107
EXPAND RECTANGLES
S108
CREATE IMAGE INCLUDING PHOTOGRAPH RECTANGLES WHOSE AREAS ARE PAINTED ENTIRELY WITH A COLOR
S109
CREATE BINARY IMAGE
S110
CARRY OUT OCR PROCESS
S111
REPRODUCE DOCUMENT
S112
END

FIG. 3


START
INPUT AREA "A"
S201
ELIMINATE NOISE FROM SURROUNDINGS
S202
SAMPLE A PIXEL FOR EACH 64 PIXELS
S203
REFER TO 5×5 BLOCK AREA NEAR FOCUS PIXEL
S204
CALCULATE DEGREE OF COLOR-DENSITY DISPERSION IN EACH OF 9 TYPES OF AREAS SET IN 5×5 BLOCK AREA
S205
SELECT AREA WHOSE COLOR-DENSITY DISPERSION IS MINIMUM AMONG 9 TYPES OF AREAS
S206
DETERMINE REPRESENTATIVE COLOR OF AREA
S207
S208
HAS ENTIRE IMAGE OF AREA "A" BEEN SCANNED ?
NO
YES
S209
CLUSTER REPRESENTATIVE COLORS
S210
SELECT REPRESENTATIVE COLOR "B" OF LARGEST CLUSTER
S211
SET REPRESENTATIVE COLOR "B" AS BACKGROUND COLOR OF AREA "A"
END

FOREIGN PATENT

# FIG. 4

| area0 | area1 | area2 | area3 | area4 | area5 | area6 | area7 | area8 |
|---|---|---|---|---|---|---|---|---|
| 00... | ...11 | ..... | ..... | .444. | ..... | ..... | ..... | ..... |
| 000.. | ..111 | ..... | ..... | .444. | 55... | ...66 | ..... | .888. |
| .0P.. | ..P1. | .2P.. | ..P3. | ..P.. | 55P.. | ..P66 | ..P.. | .8P8. |
| ..... | ..... | 222.. | ..333 | ..... | 55... | ...66 | .777. | .888. |
| ..... | ..... | 22... | ...33 | ..... | ..... | ..... | .777. | ..... |

P : CENTER OF 5×5 BLOCK AREA
. : POINT OUTSIDE EACH AREA(area n(n=0...8))
n : POINT INSIDE EACH AREA(n=0...8)

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FIG. 5

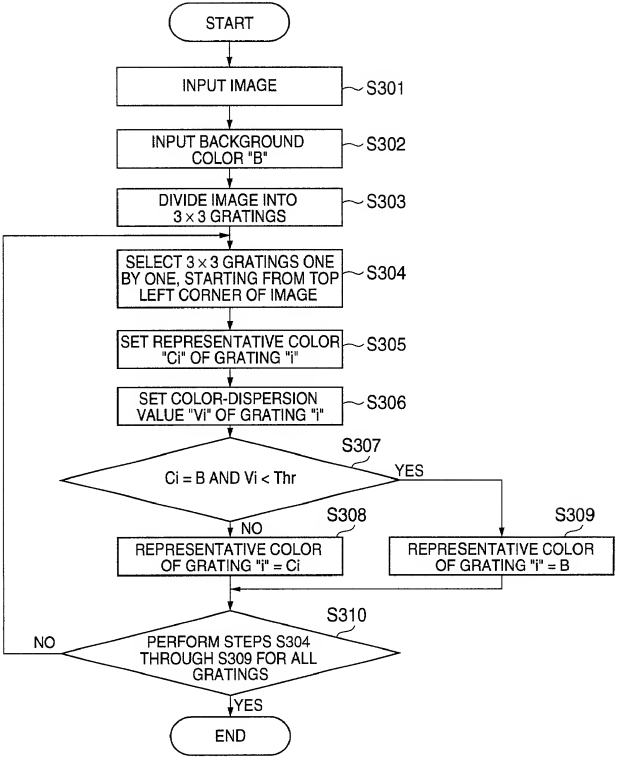

START
INPUT IMAGE
S301
INPUT BACKGROUND COLOR "B"
S302
DIVIDE IMAGE INTO 3 × 3 GRATINGS
S303
SELECT 3 × 3 GRATINGS ONE BY ONE, STARTING FROM TOP LEFT CORNER OF IMAGE
S304
SET REPRESENTATIVE COLOR "Ci" OF GRATING "i"
S305
SET COLOR-DISPERSION VALUE "Vi" OF GRATING "i"
S306
S307
Ci = B AND Vi < Thr
YES
NO
S308
REPRESENTATIVE COLOR OF GRATING "i" = Ci
S309
REPRESENTATIVE COLOR OF GRATING "i" = B
S310
NO
PERFORM STEPS S304 THROUGH S309 FOR ALL GRATINGS
YES
END

FIG. 6A

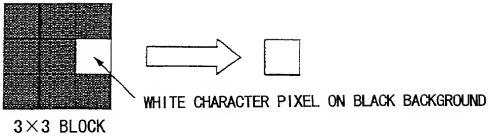

WHITE CHARACTER PIXEL ON BLACK BACKGROUND
3×3 BLOCK

FIG. 6B

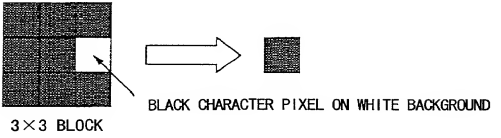
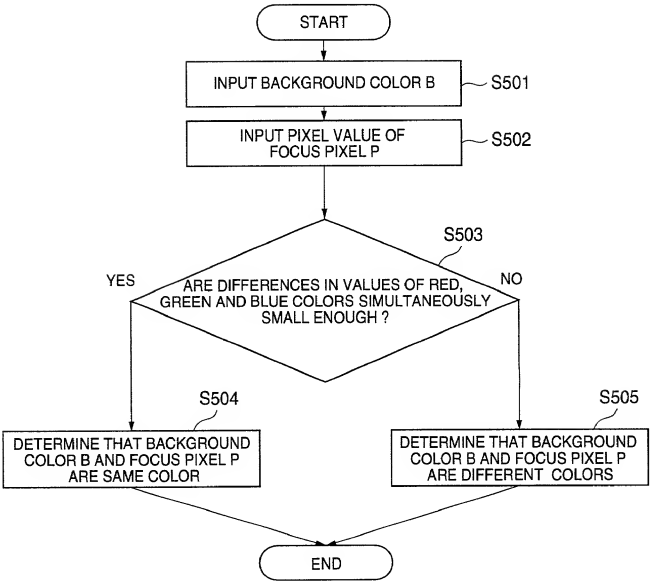

BLACK CHARACTER PIXEL ON WHITE BACKGROUND
3×3 BLOCK

FIG. 7


START
INPUT BACKGROUND COLOR B
S501
INPUT PIXEL VALUE OF FOCUS PIXEL P
S502
S503
ARE DIFFERENCES IN VALUES OF RED, GREEN AND BLUE COLORS SIMULTANEOUSLY SMALL ENOUGH ?
YES
NO
S504
DETERMINE THAT BACKGROUND COLOR B AND FOCUS PIXEL P ARE SAME COLOR
S505
DETERMINE THAT BACKGROUND COLOR B AND FOCUS PIXEL P ARE DIFFERENT COLORS
END

FOUND PTO6680

FIG. 8

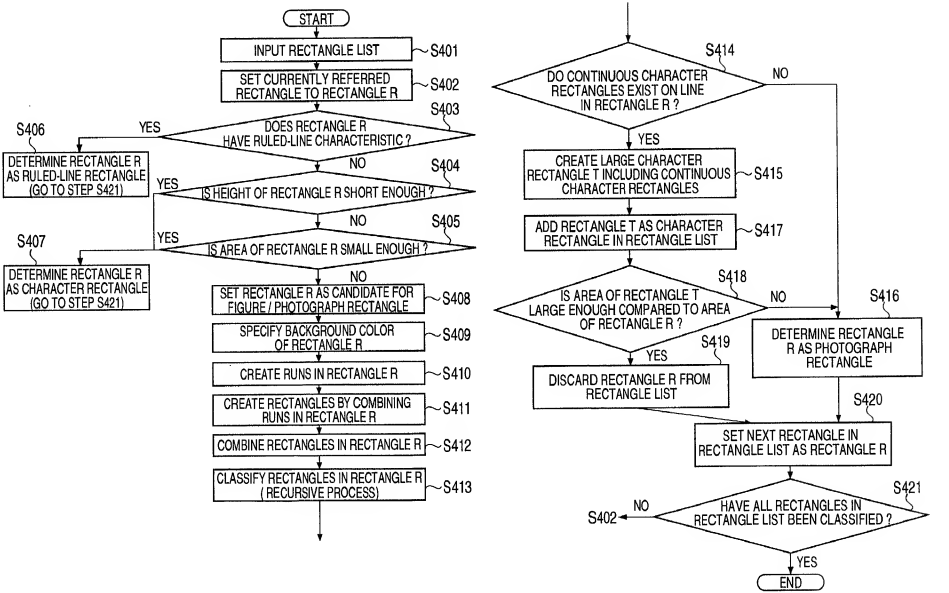



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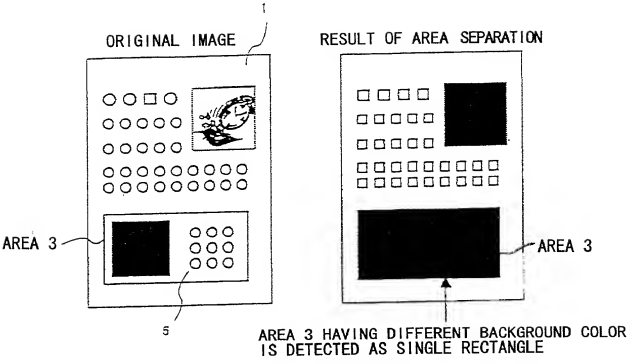
FIG. 9


1
ORIGINAL IMAGE
RESULT OF AREA SEPARATION
AREA 3
AREA 3
5
AREA 3 HAVING DIFFERENT BACKGROUND COLOR
IS DETECTED AS SINGLE RECTANGLE

TOUCHSTONE2000

FIG. 10

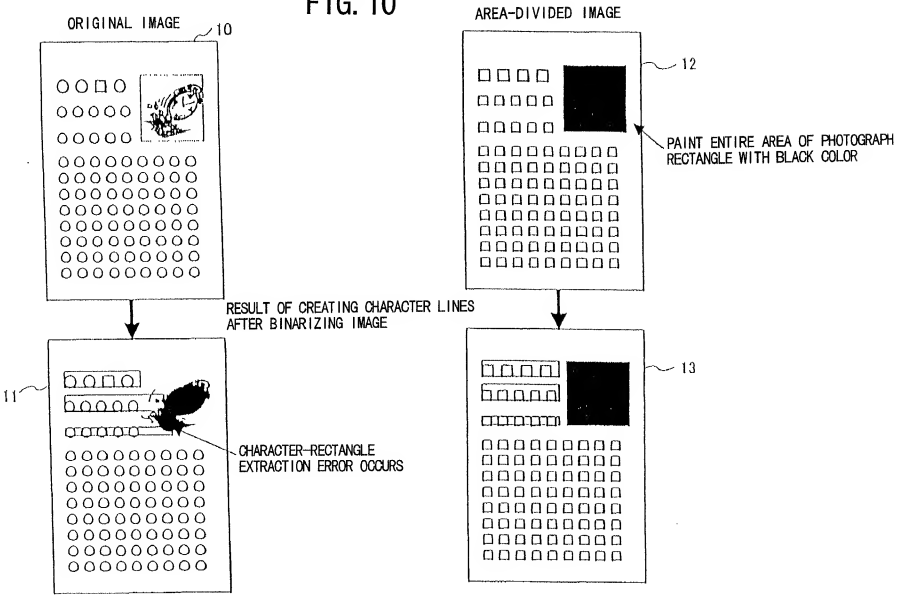



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FIG. 11

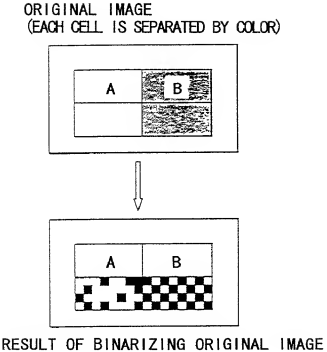

ORIGINAL IMAGE
(EACH CELL IS SEPARATED BY COLOR)
A
B
A
B
RESULT OF BINARIZING ORIGINAL IMAGE
BY ANALYZING EACH AREA

FIG. 12

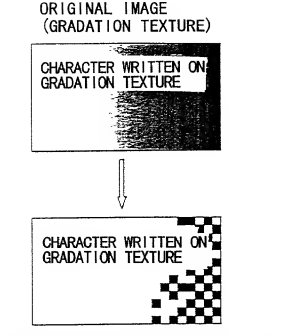

ORIGINAL IMAGE
(GRADATION TEXTURE)
CHARACTER WRITTEN ON
GRADATION TEXTURE
CHARACTER WRITTEN ON
GRADATION TEXTURE
RESULT OF BINARIZING ORIGINAL IMAGE
BY ANALYZING EACH AREA

FIG. 13

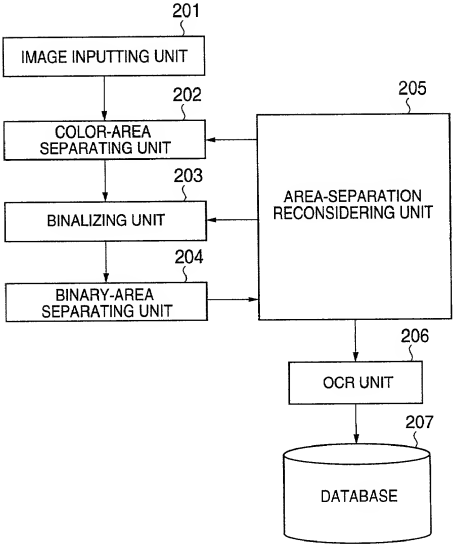

201
IMAGE INPUTTING UNIT
202
COLOR-AREA SEPARATING UNIT
203
BINALIZING UNIT
204
BINARY-AREA SEPARATING UNIT
205
AREA-SEPARATION RECONSIDERING UNIT
206
OCR UNIT
207
DATABASE

FIG. 14

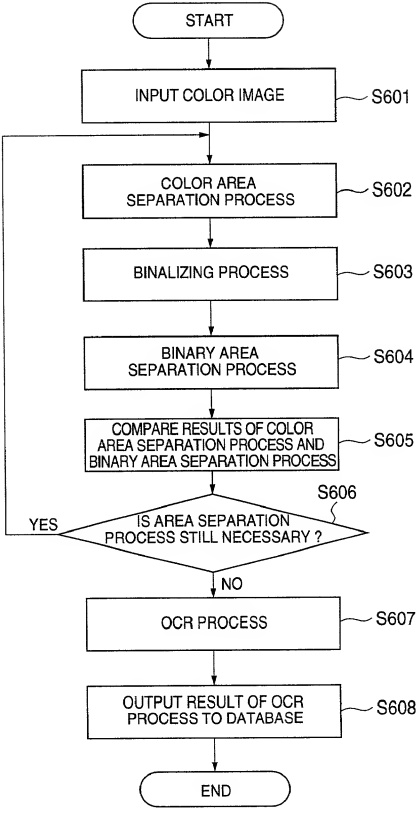
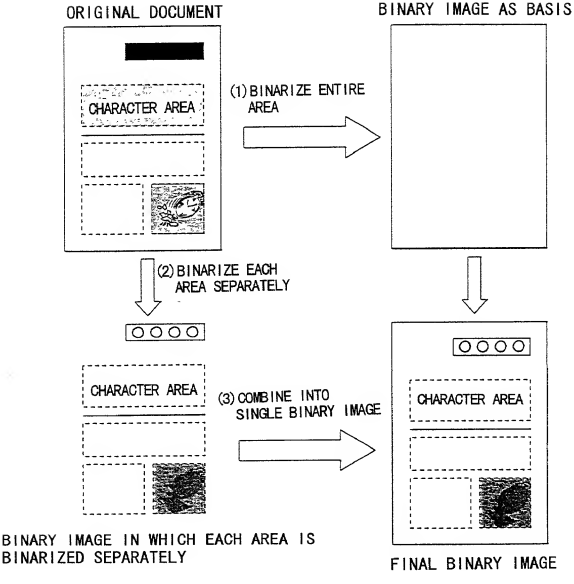

START
INPUT COLOR IMAGE
S601
COLOR AREA SEPARATION PROCESS
S602
BINALIZING PROCESS
S603
BINARY AREA SEPARATION PROCESS
S604
COMPARE RESULTS OF COLOR AREA SEPARATION PROCESS AND BINARY AREA SEPARATION PROCESS
S605
S606
IS AREA SEPARATION PROCESS STILL NECESSARY ?
YES
NO
OCR PROCESS
S607
OUTPUT RESULT OF OCR PROCESS TO DATABASE
S608
END

FIG. 15


ORIGINAL DOCUMENT
CHARACTER AREA
(1) BINARIZE ENTIRE AREA
BINARY IMAGE AS BASIS
(2) BINARIZE EACH AREA SEPARATELY
CHARACTER AREA
(3) COMBINE INTO SINGLE BINARY IMAGE
CHARACTER AREA
BINARY IMAGE IN WHICH EACH AREA IS BINARIZED SEPARATELY
FINAL BINARY IMAGE

TOUCHU TECHNO

FIG. 16

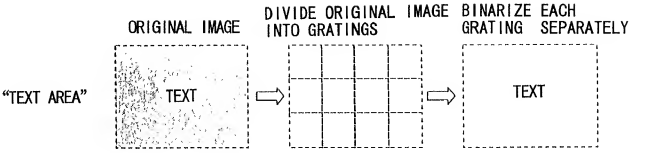



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FIG. 17

| WIDTH OF AREA | WIDTH OF GRATING |
|---|---|
| 512 | 32 |
| 1024 | 64 |
| 2048 OVER | 128 |

FIG. 18

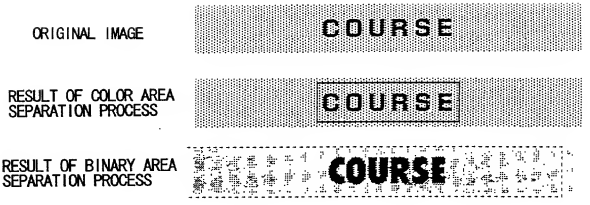

ORIGINAL IMAGE
COURSE
RESULT OF COLOR AREA SEPARATION PROCESS
COURSE
RESULT OF BINARY AREA SEPARATION PROCESS
COURSE

FIG. 19

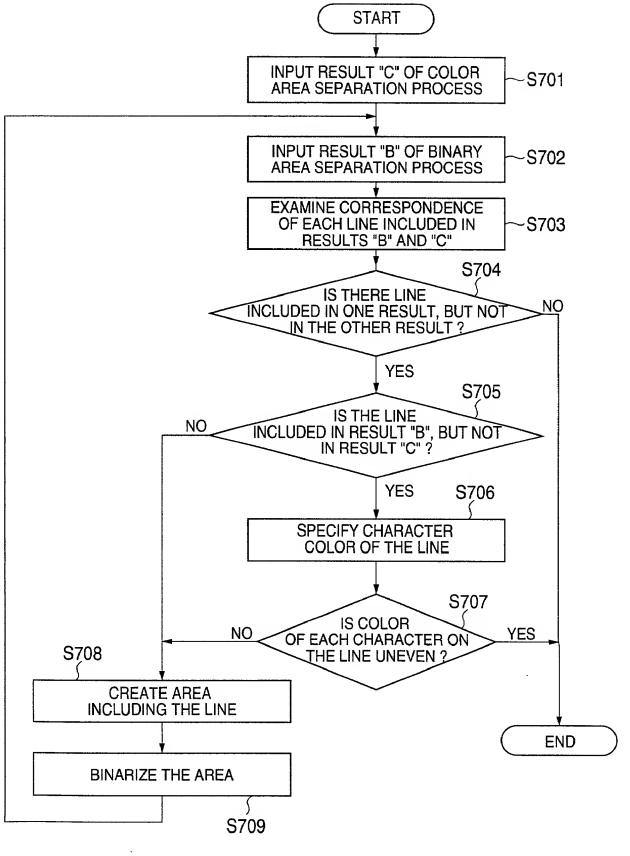
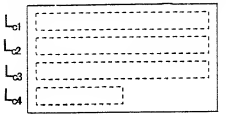

START
INPUT RESULT "C" OF COLOR AREA SEPARATION PROCESS
S701
INPUT RESULT "B" OF BINARY AREA SEPARATION PROCESS
S702
EXAMINE CORRESPONDENCE OF EACH LINE INCLUDED IN RESULTS "B" AND "C"
S703
S704
IS THERE LINE INCLUDED IN ONE RESULT, BUT NOT IN THE OTHER RESULT ?
NO
YES
S705
IS THE LINE INCLUDED IN RESULT "B", BUT NOT IN RESULT "C" ?
NO
YES
S706
SPECIFY CHARACTER COLOR OF THE LINE
S707
IS COLOR OF EACH CHARACTER ON THE LINE UNEVEN ?
NO
YES
S708
CREATE AREA INCLUDING THE LINE
BINARIZE THE AREA
S709
END

FIG. 20A

RESULT OF COLOR AREA SEPARATION PROCESS




AREA RECTANGLE
TEXT RECTANGLE

FIG. 20B

RESULT OF BINARY AREA SEPARATION PROCESS

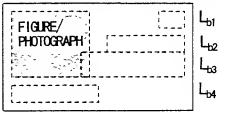
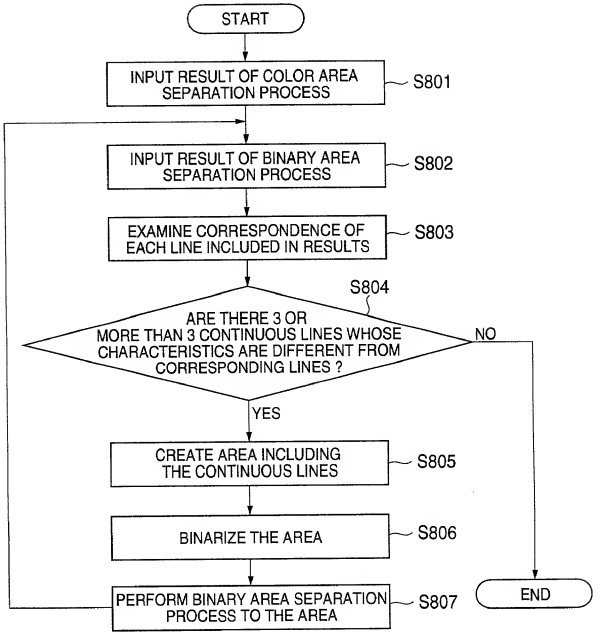


FIG. 21


START
INPUT RESULT OF COLOR AREA SEPARATION PROCESS
S801
INPUT RESULT OF BINARY AREA SEPARATION PROCESS
S802
EXAMINE CORRESPONDENCE OF EACH LINE INCLUDED IN RESULTS
S803
S804
ARE THERE 3 OR MORE THAN 3 CONTINUOUS LINES WHOSE CHARACTERISTICS ARE DIFFERENT FROM CORRESPONDING LINES ?
NO
YES
CREATE AREA INCLUDING THE CONTINUOUS LINES
S805
BINARIZE THE AREA
S806
PERFORM BINARY AREA SEPARATION PROCESS TO THE AREA
S807
END